

desired extent has been greatly strengthened. This work was for six years most efficiently directed by the late Mr. James W. Milner, and is now in charge of Major T. B. Ferguson, also Commissioner for the State of Maryland, by whom has been devised the machinery for propagation on a gigantic scale, by the aid of steam, which is now so successfully in use.

The investigation of the statistics and history of the fisheries has perhaps assumed greater proportions than was at first contemplated. One of the immediate causes of the establishment of the Commission was the dissension between the line and net-fishermen of southern New England with reference to laws for the protection of the deteriorating fisheries of that region. The first work of Prof. Baird as Commissioner was to investigate the causes of this deterioration, and the report of that year's work includes much statistical material. In the same year a zoological and statistical survey of the great lakes was accomplished, and various circulars were sent out in contemplation of the preparation of monographic reports upon the special branches of the fisheries, some of which have already been published.

Some thirty trained experts are now engaged in the preparation of a statistical report on the present state and the past history of the fisheries of the United States. This will be finished next year, but the subject will hereafter be continued in monographs upon separate branches of the fisheries, such as the hohibut fishery, the mackerel fishery, the shad fishery, the cod fishery, the herring fishery, the smelt fishery, and various others of less importance.

Hundreds, and even thousands of specimens of a single species are often obtained. After those for the National Museum have been selected, a great number of duplicates remain. These are identified, labelled, and made up into sets for exchange with other museums and for distribution to schools and small museums. This is in accordance with the time-honoured usage of the Smithsonian Institution, and is regarded as an important branch of the work. Several specialists are employed solely in making up these sets and in gathering material required for their completion. Within three years fifty sets of fishes in alcohol, including at least ten thousand specimens, have been sent out, and fifty sets of invertebrates, embracing 175 species and 25,000 specimens. One hundred smaller sets of representative forms intended for educational purposes, to be given to schools and academies, are now being prepared. The arrangement of the invertebrate duplicates is in the charge of Mr. Richard Rathbun; of the fishes, in that of Dr. T. H. Bean. Facilities have also been given to many institutions for making collections on their own behalf. Six annual reports have been published, with an aggregate of 5,650 pages. These cover the period 1871 to 1878. Many papers relating to the work have been published elsewhere, particularly descriptions of new species and results of special faunal exploration.

The season of 1880 was opened by the participation of the Commission in the International Exhibition at Berlin. The first honour-prize, the gift of the Emperor of Germany, was awarded to Prof. Baird, not alone as an acknowledgment that the display of the United States was the most perfect and most imposing, but as a personal tribute to one who, in the words of the president of the Deutscher Fisherei Verein, is regarded in Europe as the first fish-culturalist in the world.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—This year the term commences somewhat later than usual. The professorial lectures on natural science begin next week. At the University Museum Dr. Odling lectures on Typical Alcohols, Prof. Clifton on Experimental Electricity, Prof. Price on Hydro mechanics, Prof. Story-Maskelyne, M.P., on the Elements of Crystallography, Prof. Prestwich on Stratigraphical Geology, and Prof. Rolleston on Digestion.

Lectures are also given in the Chemical Department at the Museum by Mr. W. W. Fisher, on Inorganic Chemistry, by Mr. J. Watts on Organic Chemistry, and by Dr. F. D. Brown on Chemical Affinity. In the Biological Department Messrs. C. Robertson, W. H. Jackson, and A. P. Thomas form classes for instruction in Microscopy and Zoology. Mr. Barclay Thompson gives a course on the Comparative Anatomy of the Mammalia. In the Clarendon Laboratory Mr. Stocker lectures on Elementary Mechanics, and, with Mr. V. Jones, gives instruction in practical physics.

At the University Observatory Prof. Pritchard will lecture on

Spherical Astronomy, including instruments, and will give a course of six lectures on the Precession of the Equinoxes, including the Lunar Physical Libration. The Observatory is opened on Monday and Tuesday evenings during the term to members of the University who desire to obtain instrumental practice. In his annual report to the Board of Visitors the Professor gives an account of the work carried on during the past year at the Observatory. The long series of observations in reference to the Inequalities in the Moon's Rotation are now finished, and the results will be shortly published. The calculations were brought to a successful issue during the Long Vacation, and afford a general confirmation of the investigations of Bouvard, Nicollet, and Wichmann, and establish the existence of small but sensible inequalities in the moon's rotation. Careful measurements have also been made by Mr. Plummer of the relative positions of forty stars in the Pleiades, and Mr. Jenkins has measured the relative co-ordinates of 250 stars in the cluster 39 Messier. Careful observations have also been made of the component stars of ξ Ursæ Majoris and 70 Ophiuchi. With regard to the instruments the Professor writes:—

"The large refractor has been thoroughly examined and cleaned by Mr. Grubb, the artist who constructed it. This at present is in an efficient working condition in every respect. From our own resources we have thoroughly overhauled the De La Rue Reflector, and it also is in excellent condition. It is fortunate for the University that both these instruments pass from time to time under the experienced and critical eye of Dr. De La Rue himself. For a time Dr. De La Rue's metallic speculum was replaced by an excellent silvered glass mirror, executed by Mr. With; the newer mirror possessed the greater capacity of the two, in point of brilliancy of reflected light, but was not deemed quite equal to Dr. De La Rue's in point of definition; we have therefore returned to the use of the original speculum.

"In order to carry out a new and important series of astronomical observations I soon found that the use of a chronograph was indispensable; accordingly I have, in conjunction with Mr. Grubb, devised a very inexpensive but practically efficient form of that instrument. The total cost of this instrument, together with a corresponding and necessary addition to the mechanism of the sidereal clock, has not exceeded 10*l*. I am told on the best authority that this form of the chronograph will henceforth prove a desirable adjunct in other observatories.

"With the view of bringing practical astronomy within the reach of a moderate expenditure I have (again in conjunction with Mr. Grubb) devised a modification of existing small equatorial telescopes, which I anticipate will prove a boon to beginners in astronomical science.

"Lastly, I have devised and carried into execution a simple form of precessional globe for the use of students in astronomy. It affords very ready means of representing the risings and settings of the stars, and the general aspect of the heavens at the remotest periods of time, past and future, and as seen at any locality."

In the Botanic Garden Prof. Lawson will give instruction on the Minute Anatomy of the Vegetable Tissues.

The following lectures are given in those colleges which possess laboratories. At Christ Church Mr. Vernon Harcourt lectures on the Non-metallic Elements, and Mr. R. E. Baynes on Dynamical Electricity and Conduction of Heat. At Balliol College Mr. J. W. Russell lectures on Problems in Mechanics, and Mr. H. B. Dixon on Elementary Heat and Light. At Exeter College Mr. Lewis Morgan lectures on Practical Histology, and at Magdalen College Mr. C. J. Yule gives a course of demonstrations on the Chemical Composition of the Body.

AN examination for Natural Science Scholarships is being held by Trinity and Exeter Colleges. The former College has this year for the first time offered a scholarship for proficiency in science. At Merton College the science scholarship (Post-mastership) was not awarded.

At Balliol College there will be offered next month a science scholarship, on the foundation of Miss Brakenbury, open to all candidates without limitation of age, who shall not have exceeded eight terms from matriculation. The scholarship is of the annual value of 80*l*., and is tenable for four years during residence. Papers will be set in the following subjects:—(1) Mechanical Philosophy and Physics, (2) Chemistry, (3) Physiology. Candidates will not be expected to offer themselves in more than two of these. There will be a practical examination in one or more

of the above subjects if the examiners think it expedient. Intending candidates should communicate with the Master of Balliol before November 12. There will also be offered two exhibitions worth 40% a year, the examination for which will comprise the elements of Physics, Chemistry, or Physiology, as well as Classics and Mathematics.

CAMBRIDGE.—Dr. Michael Foster will lecture on elementary physiology; Mr. Langley will lecture to the advanced class on general physiology twice a week; Mr. Lea takes physiological chemistry; and Dr. Gaskell the physiology of the circulation.

Mr. VENN will lecture during the next two terms on scientific method.

MR. FREEMAN of St. John's College is to lecture as deputy for Prof. Challis, owing to his infirm health.

DR. REGINALD THOMPSON of Trinity College is to be one of the Examiners for 3rd M.B., and Dr. Cheadle to be Assessor to the Regius Professor of Physic.

THE list of lecturers at Newnham College this term includes the names of Miss Crofts (English History and Literature), Miss Merrifield (Greek), Miss Harland (Algebra), and Miss Scott (Analytical Conics). The lectures are now delivered at the College, and not in Alexandra Hall.

AT St. Thomas's Hospital Medical School Mr. Robert Lawson has obtained the Entrance Scholarship in Natural Science, of the value of 100%, and Mr. Herbert Lankester that of 60%.

AT the meeting of the Council of the College of Physical Science, Newcastle-on-Tyne, on October 11, it was decided without opposition that a lady candidate, Miss Isabel M. Aldis, should be allowed to hold an exhibition in the College. This decision completes the opening of the advantages of the College to lady students. They were previously admitted to all the lectures, but this is the first time that a lady has been a candidate for an exhibition.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, October 11.—M. Wurtz in the chair. The following papers were read:—On the rôle of time in the formation of salts, by M. Berthelot. Experiments with several hundred saline mixtures prove that the period of change in saline reactions, comprised between the moment when the system has become physically homogeneous and that when it attains its chemical equilibrium, is excessively short, and wholly included in the short duration of the calorimetric experiment. The same period in ethene reactions, on the other hand, is incomparably longer. The instantaneity in the former case is proved by an application of the author's theorem of slow actions.—On pellagra in Italy, by M. Faye. In the past year there have been 40,000 well-marked cases of the disease in Lombardy, and 30,000 in Venetia, the richest and most productive provinces in Italy. It is unknown in Naples, Sicily, and Sardinia (so poverty and bad hygiene do not seem to be the causes). Wherever pellagra appears in the endemic state *polenta* or *cruchade* are eaten, *i.e.*, varieties of unfermented bread (made from maize and millet), and M. Faye thinks the substitution of fermented bread would prove salutary.—On the photophonic experiments of Prof. Bell and Mr. Sumner Tainter, by M. Breguet.—On algebraic equations, by Mr. West.—Earthquakes at Smyrna on July 29, by Dr. Charpentin. The ravages and phenomena of this earthquake were limited to the Sipyle chain and the adjoining plains in a perimeter of only a few leagues; but the *contre-coup* was felt at great distances (Broussa, Rhodes, &c.). Chronometers at Athens were stopped. More than 3,000 years ago there seems to have been a volcano under Sipyle, and this point has been the centre of earthquakes in that region. The approximate coincidence (in time) of this last Smyrna earthquake with earthquakes at Manilla, the Azores, and Naples, is remarkable.—On the effects produced by cultivation of absinthe as insectifuge, and on its preventive application against phylloxera, by M. Poirot. Among the absinthe plants covering large tracts in North America the author has never seen flies, ants, worms, or any insects, nor yet scorpions, tarantulas, nor rattlesnakes. Land manured with absinthe might be fatal to the metamorphoses of phylloxera.—Ephemerides of comet δ 1880 (continued), by M. Bigourdan.—Observations of comet δ 1880 (discovered by Dr. Hartwig at Strassburg) at the Paris Observatory, by M. Bigourdan.—On the resolvent function of the equation $x^m + px + q = 0$, by M. Pujet.—On a property of Poisson's function, and on the integration of equations with partial

derivatives of the first order, by M. Gilbert.—On a very extensive class of linear differential equations with rational coefficients, whose solution depends on the quadrature of an irrational algebraic product, by M. Dillner.—Principle of an algebraic calculus which contains as particular species the calculus of imaginary quantities and quaternions, by M. Lipschitz.—On the partition of numbers, by M. David.—On the mechanical actions of light, theoretical considerations capable of serving in interpretation of Prof. Bell's experiments, by M. Cros. In 1872 M. Cros presented a memoir to the Academy, in which, guided by theoretical considerations, he affirmed *à priori* the results of experiments which he thinks have a notable similarity to Prof. Bell's. In one experiment a ray of light interrupted n times a second was to be sent into a tube resonating with a note of n vibrations. The alternate rarefaction and condensation of the gaseous medium might make the tube speak.—Study of the distribution of light in the solar spectrum, by MM. Macé and Nicati. The maximum intensity is in the yellow, very near D. The perception of blue and violet diminishes much more slowly with diminished illumination than that of less refrangible colours. From the extreme red to green of about 0.5μ wave-length, the law of distribution of intensity is the same whatever the illumination. Between eyes equally capable of discerning colour, there are very sensible differences.—Vibratory forms of circular pellicles of sapsaccharic liquid, by M. Decharme. With a given diameter of pellicle the numbers of nodals are inversely proportional to the corresponding lengths of the vibrating rod (which produces the waves).—On the place which boron occupies in the series of simple bodies, by M. Etard. He places boron in the family of vanadium, very near that of phosphorus.—On propylacetal and isobutylacetal, by M. de Girard.

CONTENTS

PAGE

SCIENTIFIC WORTHIES, XVI.—RICHARD OWEN (<i>With Steel Plate Engraving</i>)	577
INSECT VARIETY	579
WEAPONS AND POLITICS OF THE ANCIENT HINDUS	581
OUR BOOK SHELF:—	
Barfœde's "Lehrbuch der organischen Qualitativen Analyse"	581
Carr's "Synopsis of Elementary Results in Pure and Applied Mathematics"	582
Quiroga's "Estudio Micrográfico de Algunos Basaltos de Cuidad-Real"	582
Cameletti's "Il Binomio di Newton"	582
LETTERS TO THE EDITOR:—	
Photograph of the Nebula in Orion.—Prof. HENRY DRAPER	583
An Annelidan Entozoon.—G. E. DOBSON	583
Sounds made by Ants.—S. E. PEAL	583
Faraday Exhibiting Ghosts.—W. S.	583
Ice under Pressure.—Dr. THOS. CARNELLEY	583
A Peat Bed in the Drift at Oldham.—P. O. HUTCHINSON; JAMES NIELD	584
Temperature of the Breath.—Dr. R. E. DUDGEON	584
Selenium.—A. T. F.	585
Dynastes Hercules.—Dr. A. ERNST	585
What is Alreze?—Dr. A. ERNST	585
Rainfall of Sierra Leone.—W. HUME HART	589
An Octopus.—C. G. O'BRIEN	585
SYNTHESIS OF CITRIC ACID	585
PLANTS FROM LAKE NYASSA AND LAKE TANGANYIKA	586
GRAHAM BELL'S EXPERIMENTS IN BINAURAL AUDITION (<i>With Illustration</i>)	586
THE GEOLOGY OF THE LIBYAN DESERT	587
PHYSICS WITHOUT APPARATUS, VIII. (<i>With Illustrations</i>)	588
THE GERMINATION OF WELWITSCHIA MIRABILIS. By F. ORPEN BOWER	590
NOTES	591
OUR ASTRONOMICAL COLUMN:—	
The Binary Star δ Equulei	593
Faye's Comet	593
Hartwig's Comet	593
Comets 1880, δ and ϵ	594
METEOROLOGICAL NOTES	594
BIOLOGICAL NOTES:—	
Nest-Building Amphipods	594
Death by Hanging	595
Hæmoglobin in Echinoderms	595
An Optical Property of the Cornea	595
Phosphoric Acid in the Urine of Cows	595
Rudimentary Coma in Godetia	595
PHYSICAL NOTES	595
GEOGRAPHICAL NOTES	596
THE FIRST DECADE OF THE UNITED STATES FISH COMMISSION—ITS PLAN OF WORK AND ACCOMPLISHED RESULTS, SCIENTIFIC AND ECONOMICAL. By G. BROWN GOODE	597
UNIVERSITY AND EDUCATIONAL INTELLIGENCE	599
SOCIETIES AND ACADEMIES	600